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ABSTRACT

The Purdue Academic Learning Opportunity Systems (PALOS), a state-wide program based at Purdue University, was established to provide an administrative structure to enhance the education of Indiana adult residents. The PALOS Mathematics program was designed to increase mathematics achievement levels for selected Indiana populations. The initial funding was for adults who were deficient in mathematical skills. By September 1988, interactive videodisk units had been placed at seven sites, across Indiana, selected to provide variety in both learners and administrative environment. The first programs to be implemented were a basic mathematics program and an algebra program produced by Health Edutech, Minneapolis. Problems encountered since the project began include: (1) some students are unable to read the computer screens because of low reading levels and language barriers; (2) no clear procedures exist for the integration of the interactive videodisk system into existing programs; (3) administrators lack technical knowledge; and (4) successful remote site installation will require documentation on hardware and software purchasing, installation, and use of the system with particular students or groups of students. (GL)

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PALOS Mathematics: Education by Videodisc

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Introduction

The Purdue Academic Learning Opportunity Systems (PALOS) was established to provide an administrative structure to enhance the education of Indiana adult residents. It is a state-wide program based at Purdue University.

PALOS Mathematics is a program to develop a state-wide mathematics program designed to significantly increase mathematics achievement levels for selected Hoosier populations. Our initial funding is for adults (> 16) who are deficient in their mathematical skills. This deficiency may have been caused by an unsatisfactory high school education, by dropping out of school, or having been "passed by" as technology makes more demands for increased education. There is nothing that will make the application of this program unique to Indiana.

The need to upgrade skills in mathematics (as well as other areas) is well known unless you have read no newspapers, heard no radio, or seen no television. To make the point about this need let me review some numbers.

23 million Americans are illiterate!

Our program is not designed to do anything for these people, who first need to get their reading skills to a level that will make it possible to read math problems. Some of these people will participate in cooperation with a tutor who can assist them with the reading. Moving up an academic level, 23-26 million more Americans are functionally illiterate.

By functionally illiterate we mean that they cannot read, write or do mathematics adequately enough to satisfy self determined objectives, meet societal demands, and solve problems of daily life.

Currently 2.3 million people join this pool annually. This group is composed of 400,000 legal immigrants, 150,000 refugees, 800,000 illegal immigrants, 850,000 high school drop-outs, 100,000 "push outs".

Too many institutions of higher education view these "at risk" people as someone else's problem. If we want our society to be composed of contributing members, we must all do our part. Education must be an open system-especially for adults. By an open system I mean that all who are influenced by the system must have a part in it. Secondary schools, community colleges, vocational schools, four-year institutions, business and industry and all other types of educational programs should expand cooperative programs for meeting the educational needs of their clients. Thus the birth of PALOS: Mathematics.

Project Development

During the Spring of 1988 the State of Indiana Commission for Higher Education indicated that it was prepared to fund a project that would address the problem of inadequately educated adults. We at Purdue agreed to research and develop a system to upgrade skills in mathematics. What we are doing is influenced by several factors. The commission expressed strong interest in trying interactive videodisc systems. We know that most of the adults who need to learn more

IR014151

mathematics would have experienced the conventional learning environment, what might be called the standard classroom. It is very possible that they may have negative feelings about the standard classroom. We also are aware that a good learning environment is one that is learner controlled, self-paced, and individualized. In addition, there should be immediate feedback, positive reinforcement, review options, and real life applications.

Considering these factors the decision was made that interactive video, which does provide this type of learning environment, would be our delivery system. Such an interactive system makes use of motion and still pictures, sound and video graphics. The computer software controls the interaction and maintains records of each student's progress.

Our intention is to research and develop the technology as a vehicle to meet the need of the Indiana adult population. We plan to improve the software and develop "wrap around" materials, as necessary, to enhance the overall effectiveness. "Wrap arounds" may take the form of pretests, post tests, administrator instructions, methods for reducing computer anxiety and anything else that will contribute to making this a successful experience for the learner. We know that the amount of human teaching/intervention needed varies with the ability of the student. Good learners need less teacher assistance than do weaker learners. All of these factors will be considered as the system is developed.

Site Installation

By September 1988 we had placed interactive videodisc units at seven sites across Indiana. The sites were carefully selected to provide variety in administrative environment as well as in learners. An eighth site was established in January 1989. Since we had no experience establishing stand alone sites, we wanted to be sure that most of the sites had personnel who were flexible and able to work with potential problems. Since the final objective is to develop a delivery system usable at even the most technically unsophisticated locations, additional sites selected will be increasingly in need of very user friendly operations. We hope that sufficient funds can be obtained so that additional sites can be added each year.

The first sites were two university regional campuses, two vocational technical centers, two Universities, a learning academy, and one adult education center run by a public school system. Future locations could be libraries, additional adult education centers, industries, and social welfare agencies.

Software

The first programs to be implemented were a basic mathematics program and an algebra program produced by Health Edutech, Minneapolis. Topics covered in basic math are whole numbers, fractions, decimals, decimal fractions, and percent. The algebra course covers algebra basics, evaluating algebraic expressions, solving equations, solving formulas, ratio and proportion. Site number eight is using a software package by ISC Education, Lancaster, Pennsylvania, called "Interactive Mathematics." Originally this software package was not considered because of the need for an 80 megabyte hard disk. When this need was decreased to 40 megabytes, testing of this software was possible. This software covers many of the same topics as the Health EduTech programs as well as graphics , statistics, measurement and growth.

These two software packages were the only ones we could find designed as whole courses. A third software package has now been purchased for testing. It is called Interactive Modumath produced by The Wisconsin Foundation for Technical and Adult Education. This product will be

tested at several sites during the 1989-90 project year. In general, the topics covered are the same as in the Health EduTech Basic Mathematics course. As new software becomes available, and if found to be appropriate it will be considered and tested. Although the amount of software currently available is limited, we believe that what is available provides a strong beginning. We want software that contains enough subject matter to qualify as a course rather than for a specific application. At this time it appears that the software products are not in competition. Rather each has a use that is determined by the need of the learner. Students who need to review material or who do not need or have time for lengthy concept development would use the "Basic Mathematics" or "Applied Algebra" programs. If concept development and greater detail are needed, "Modumath" should be considered. If reading level is at least seventh grade "Interactive Mathematics" should be tried. No one product is ideal for any location that has many diverse students.

Ultimately we want to be able to certify our courses as satisfying various requirements e.g., adequate for job placement or advancement, meeting GED requirements, and satisfying entry requirements for post-secondary education. Which software package best meets each of these needs to be determined.

Implementation

For the first year slightly more than $254,000 was spent on staff, equipment, and development. The PALOS project has a staff composed of a director, clerical support, instructional development specialist and an on-site person at each location.

We are using the IBM Infowindow system, IBM PS/2 model 30's and Pioneer 6000 series laser disc readers. We wanted the most advanced technology available so that it would not limit the project. In the future hardcards, CDROM, and other advances, will need to be considered.

Our time line requires that after the first seven working sites are installed and learners enter the program, we begin documentation and analysis. The summers are used for modifying administrative details and enhancing the program as necessary. The evaluation of the program will use pretests, post tests and attitude measures.

Initial tryout of data gathering instruments has taken place. Large quantities of data will be gathered during 1989-90 to assist us in determining the effectiveness of this application of IVD systems. Analysis of attitudes and achievement will be done by subject age, sex, race, educational goals, and educational background.

Problems and Considerations

Many problems have been encountered and discoveries made since the project began. One of the most important considerations is reading level. When words appear on the screen is there a voice that reads them? If not, could the student read it on his/her own or must a tutor read it to them? The Health Edutech programs have a Spanish option. Although all the spoken words are in Spanish, to do the problems one must still be able to read English. The reading levels of the particular students in this project must be a major concern for the success of the project.

How does one integrate an IVD system into an existing program? The methods seem to be as varied as the site and the learner. One can go from students who walk-in off the street to use the system to a formal course. In between is a variety of uses. Our approach has been to let each site incorporate the IVD system into their ongoing program the best way they can as they determine. We will analyze the various approaches and recommend changes as they appear to be beneficial.

Another problem is the administrator who has very limited knowledge about computer systems may perceive problems that do not exist because of the inability to recognize the cause. If student users do not know what a diskette is or have never seen one, let alone a disk drive, instructing them to place the diskette in the disk drive can be more of a challenge then initially we might have thought.

The interactive videodisc units at remote sites pose a series of small but important human/computer interaction problems. Resolving problems over the telephone is much more difficult than doing it in person. We are finding that user friendly is much more than how a computer software package communicates. For a remote IVD site to be user friendly we must include how to unpack it, set it up, turn it on/off, clean it, and how to communicate problems. A vocabulary list could be a valuable addition to user friendly remote site installation. To develop a program that can be used for adult education at remote sites, requiring an administrator with some computer knowledge to oversee it defeats the purpose of the project. The magnitude of this problem ranks with hardware/software selection and use. For this reason an instructional development specialist is preparing a booklet or perhaps a series of booklets to deal with the human-computer interface. These booklets will include information about hardware/software purchasing, installation and how to best use the system with a particular student or group of students. This may turn out to be the most important part of the project.

Conclusion

It is hoped that 400 subjects will utilize the system in Spring 1989, an additional 1500 in 1989-1990. Since adult literacy funding was not available for subsequent years, Purdue is enlarging the project to include education for a competitive workforce.

With development and implementation it is anticipated that industry will seek a contributor roll. Also spin-offs from PALOS: Mathematics from elementary schools to college remediation programs could be expected.

We believe as previous research indicates, that IVD systems do provide, 50% faster learning with 20% better retention [to be verified in this project]. It is the application of this system in a new environment that makes this project unique and exciting.

The PALOS project is a beginning not an end. Successful study and implementation will produce ideas and products which are the fulfillment of present dreams. Teachers will have another means to supply remediation and enrichment. Industry will have a tool for upgrading skills of adult workers. Some large corporations are making use of IVD but may have yet to discover its potential. Social service organizations can direct unemployed workers to a program which will increase academic skills necessary for employment. School corporations can provide opportunities for students where teacher or financial resources are limited.

Interactive computer video systems will not solve all educational problems, but they can fulfill an important role in upgrading mathematical knowledge and skills. Hopefully there will be a present solution for our present problems. For the students who participate in the PALOS project it should be an adventure in learning unlike any they have ever had.

About the Author

Dennis H. Sorge is the director of the Purdue Academic Learning Opportunity Systems: Mathematics project, Purdue University, West Lafayette, IN 47907 Phone: (317) 494-1990. He serves as an advisor on testing for the State of Indiana Department of Education, as chairman of the Higher Education Commission task force on mathematics and as chairman of the State Technical Committee on Mathematics Education for Adult Learners. Dr. Sorge has B.S. and Ph.D. degrees form Purdue University and an M.S. degree from Indiana University. He has worked and published in the area of mathematics education for 25 years, and in computer applications for 20 years.